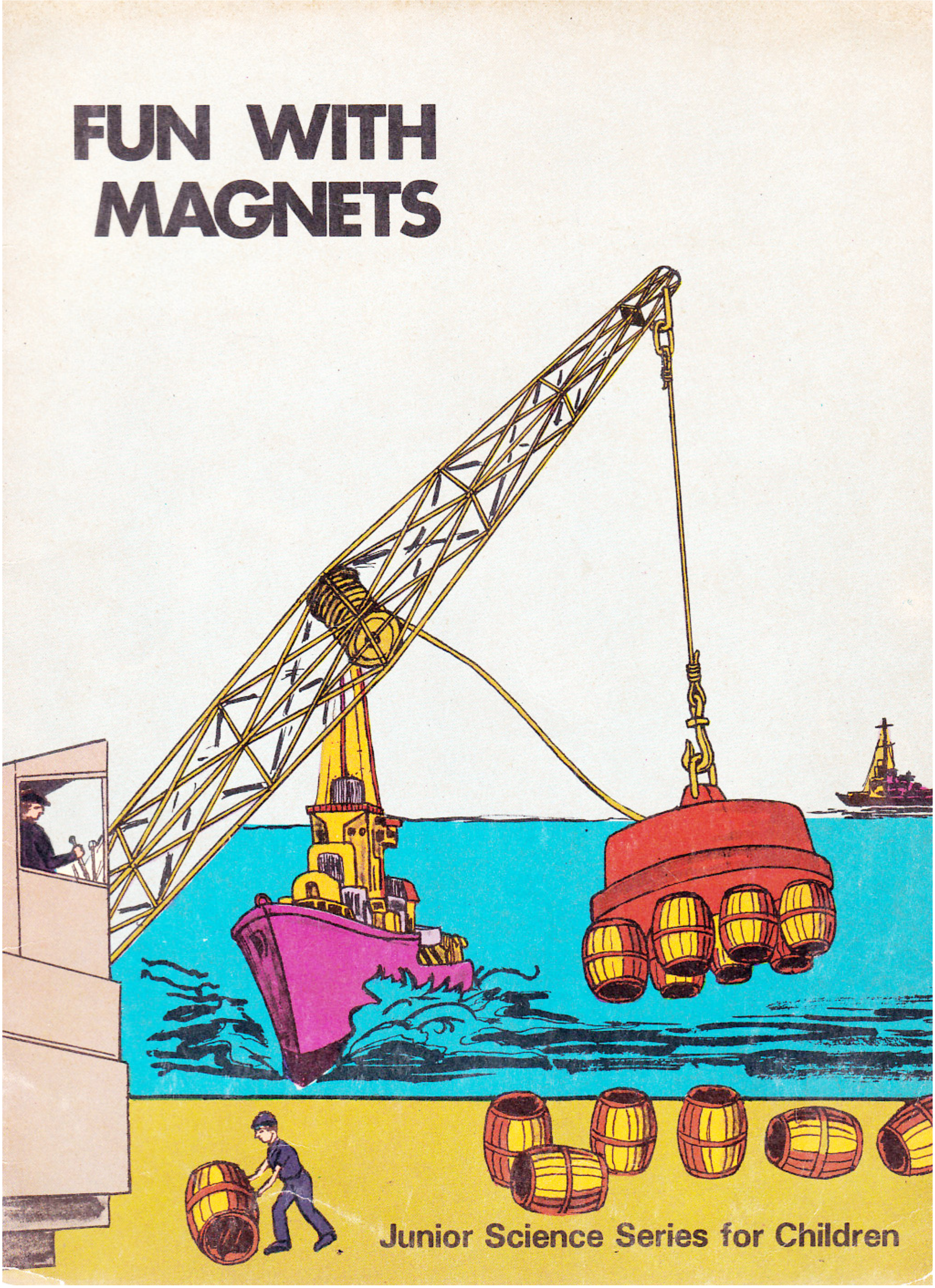
FUN WITH MAGNETS



Junior Science Series for Children

ABOUT THE BOOK

Children around 7 - 8 years, who have access to magnets, find it real fun to play with them, but the description given in lower primary science text-books about magnets and the laws that govern forces between them often take children away from the fun and enjoyment. The book : "Fun with Magnets" fills this gap by introducing children to simple games with magnets and materials available in their homes and neighbourhood. At the same time, they will understand simple concepts and facts associated with magnets as a by - product of their activities.

Children in trial schools met with some difficulty in performing initial activities suggested in this book but soon got over the same. Most of them completed all the activities without any external help and asked for more as soon as they were finished with them. Parents and teachers are, therefore, advised to encourage children to perform these activities and attempt some more, which they may like to do on their own.

General Editor: V.N. Wanchoo

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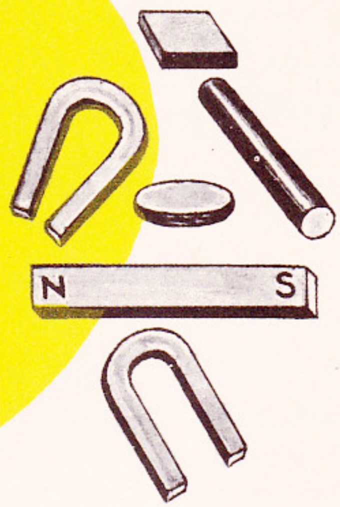

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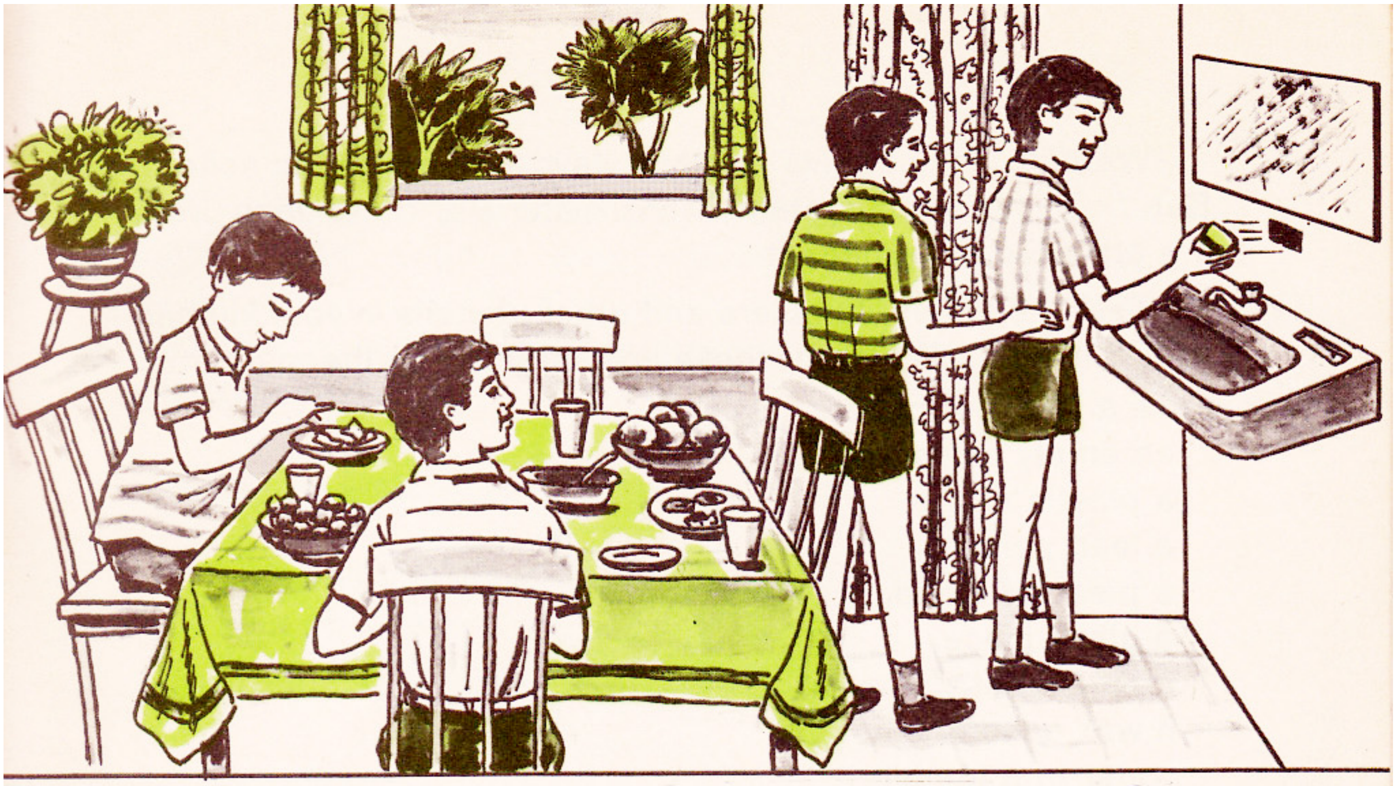


Before they sat for lunch, Ramesh and Shridhar went to the washbasin to wash their hands. Shridhar pulled the soap which was sticking to a plate fixed to the wall. He felt a pull on his hand. Later, when he returned the soap to the plate, he again felt the pull. The plate seemed to attract the soap.

"Hey ! The plate pulls the soap !" exclaimed Shridhar. "What makes it pull ?" he asked.

Ramesh smiled and said, "Try again, and find out."

Shridhar tried again and had the same feeling. He looked at the back of the soap and asked. "Is that a magnet stuck into the soap?"

"No," replied Ramesh. "The plate is a magnet and the soap has a piece of iron fixed to it," continued Shridhar. "When you pull the soap cake out, the attraction between the magnet and the iron opposes it. Thus you feel a pull."

"When you return the soap to its place, the plate on the wall again attracts the iron in the soap and you again feel a pull," observed Ramesh.

"That is right," replied Shridhar.

We can use magnets in many ways at home and in school. But, first let us understand what materials, other than iron, are attracted by a magnet.

Test the plates, tumblers and other utensils in your kitchen with a magnet. Which of these are attracted by the magnet?

Take a sheet of paper,
an empty glass bottle,
a plastic ruler,
a lead pencil,
a piece of wood,
a glass piece,
a little wool,
a wax candle,
water in a tumbler,
milk in a cup,
ink in a bottle,
a brass door handle,
a copper vessel, and
a chinaware cup.

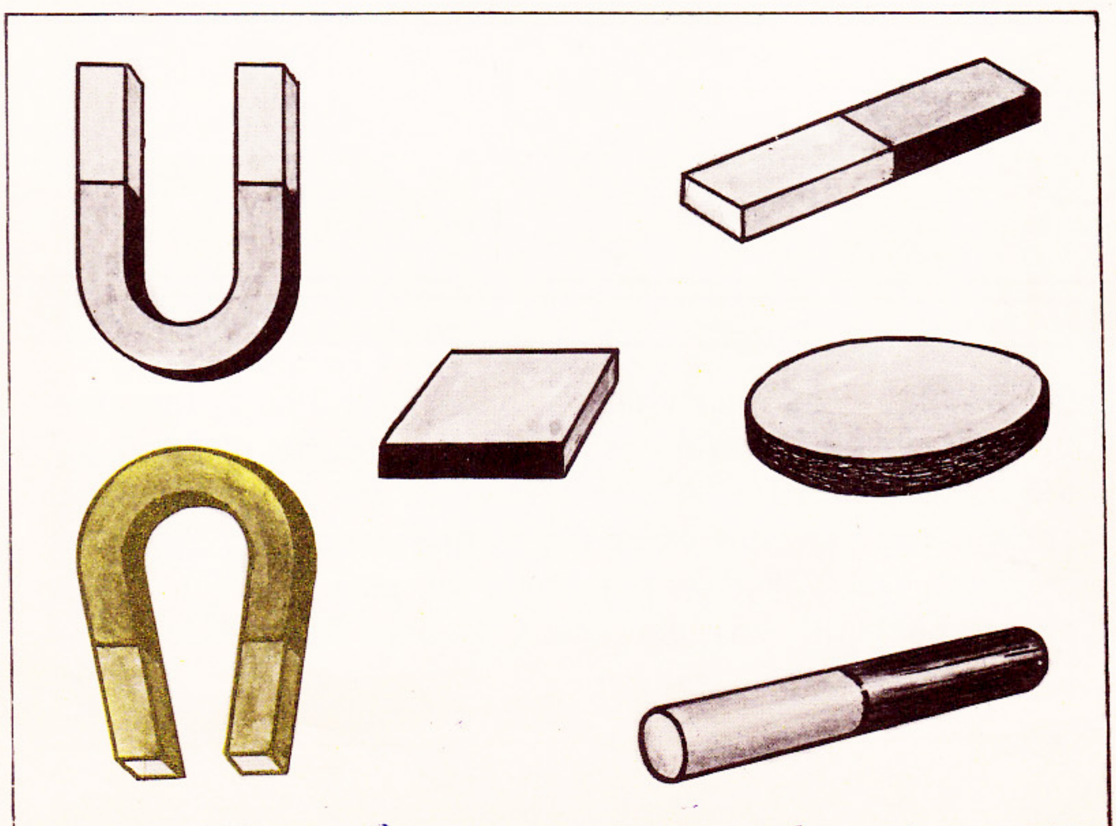
Use a magnet and find out which of these things are attracted by it.

Iron is attracted by a magnet, so is nickel. They are both called ***magnetic substances.*** Glass, wood, plastic, wool, cotton, wax, copper, brass, porcelain are not attracted by a magnet. Liquids such as water, milk, oil are also not attracted by a magnet. All these are called ***non-magnetic substances.***

Shapes of a Magnet

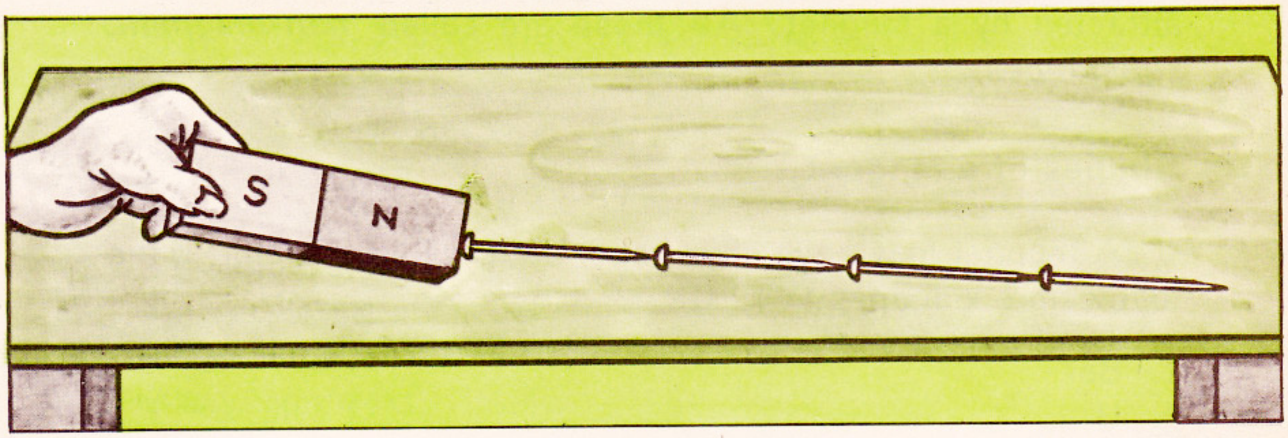
A magnet may have any shape. Usually it is available in the following six shapes :

1. Bar
2. U
3. Horse-Shoe
4. Cylindrical
5. Disc
6. Square

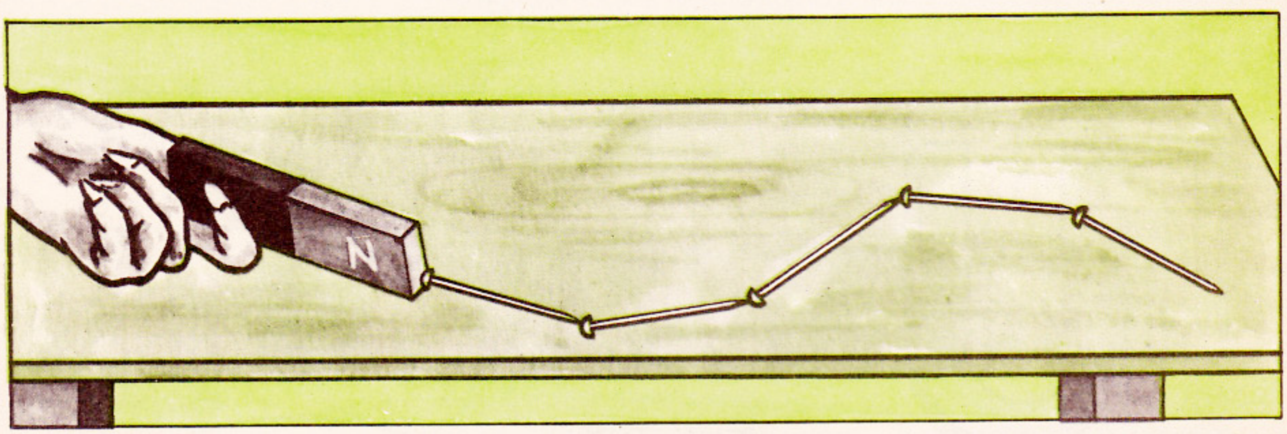


Can we make some toys?

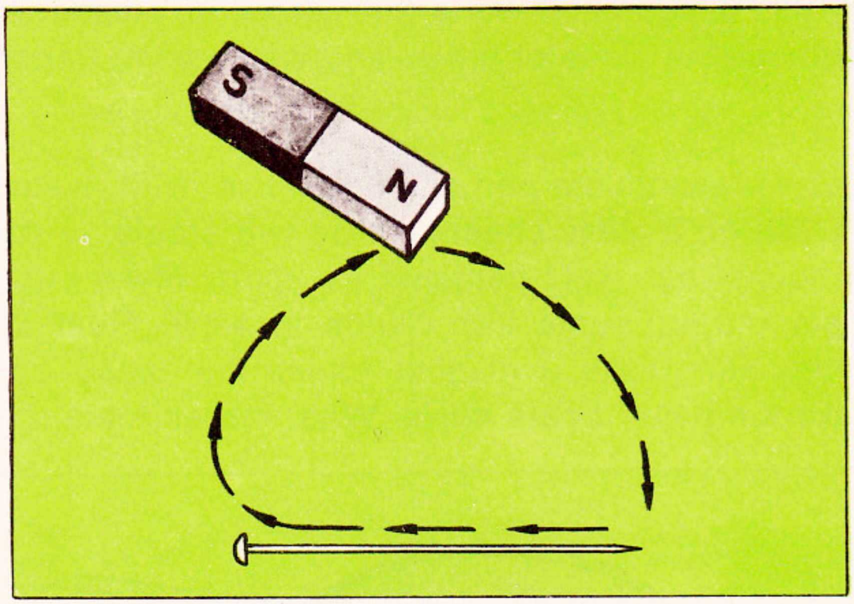
Let us now make some toys to play with and have some fun.



1. Place a bar magnet on a sheet of paper. Keep a pin near one of its ends. The pin is attracted and sticks to the magnet.



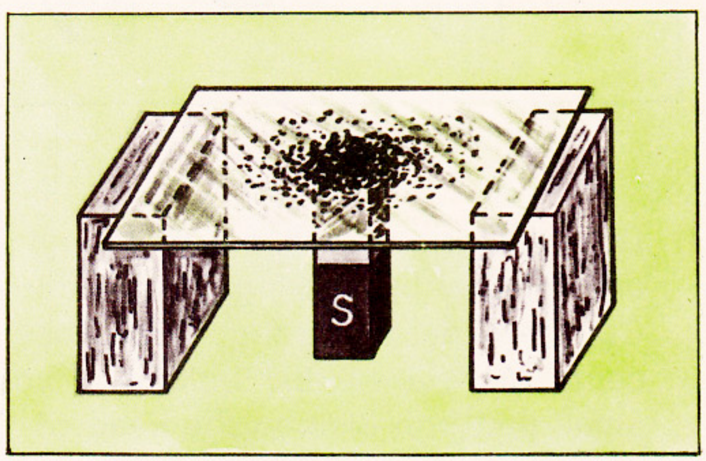
Bring another pin near the first one. This pin is attracted by the first pin. Take a third pin and a fourth pin and do the same with them. A chain of pins will be formed, as shown. You can now move the magnet from one place to another. You will see the chain of pins moving like a snake. Each pin has become a magnet and attracts the other pin.



2. You may be puzzled to know that magnetic attraction can pass through non-magnetic substances such as wood, paper, glass.

Place a thin sheet of glass over two wooden blocks, as shown. Spread iron filings on the sheet. Take a bar magnet and place it with its North pole touching the glass from below.

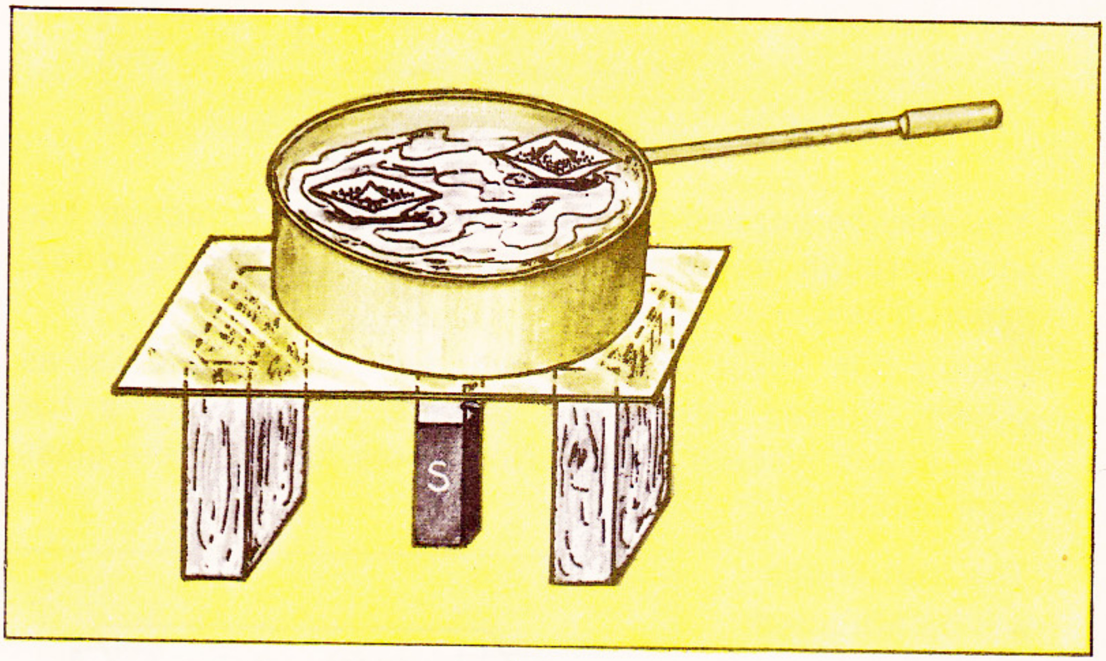
The iron filings will be attracted and will gather just above the North pole. Keeping the North pole touching the sheet, move the magnet.



The iron filings will move along with it. This shows that the power of a magnet can get across the glass sheet.

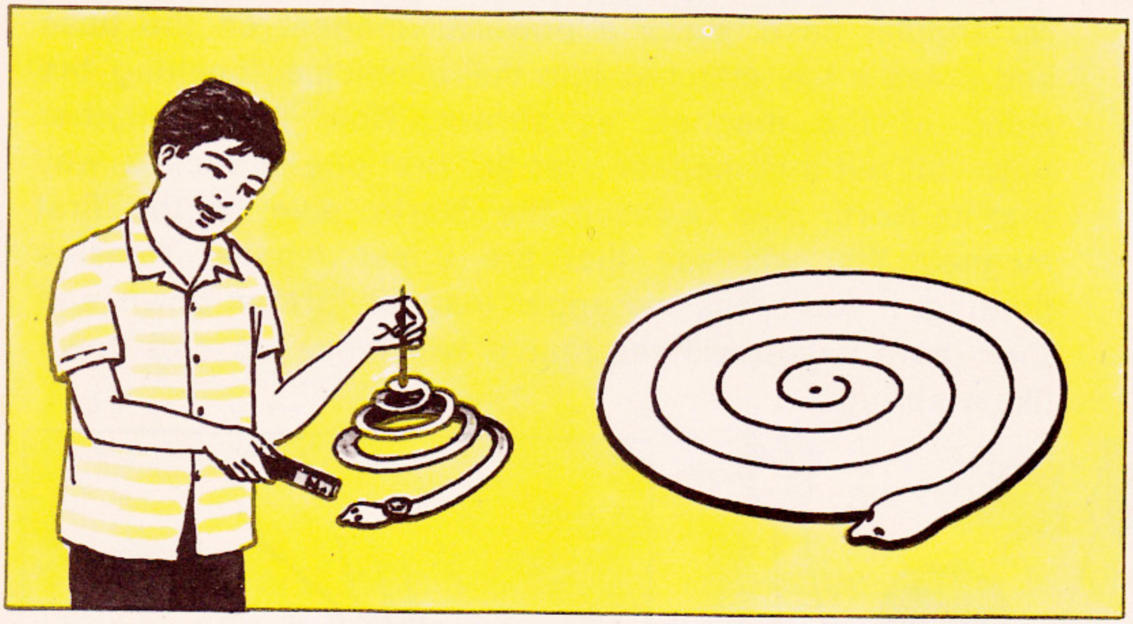
Try this experiment with a thin sheet of plastic, paper or cardboard in place of glass, and watch what happens.

3. Take an aluminium pan and half fill it with water. Place the pan on a glass sheet kept on two stools or two piles of books, about 15 centimetres apart. Make some paper boats and put some iron filings in each. Float the boats in the pan. Take a magnet under the glass sheet and make the paper boats move. What makes them move?

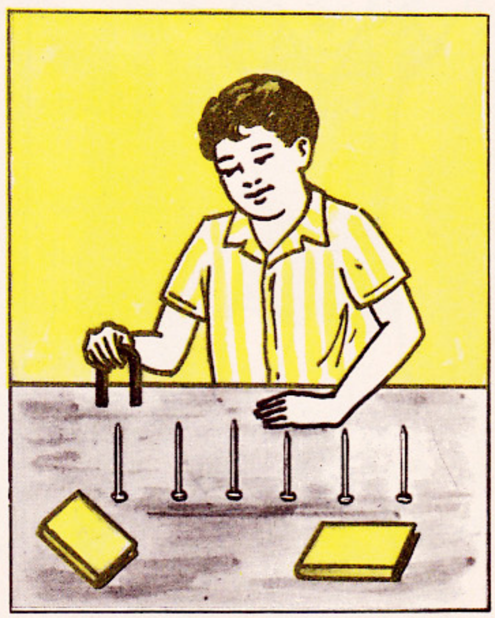


4. Draw a spiral on a sheet of heavy paper. Finish the end of the spiral by drawing the head of a snake, as shown. Cut the paper along the spiral. Pass a needle through the centre as shown and hold it in your left hand. Keep a small thin iron disc on the head of the 'snake'. Move the disc along the spiral with a magnet right up to the needle. Next, bring the disc down with the magnet, without allowing it to fall outside the spiral.

Three friends can play this game, taking turns one after another. One loses a point when the disc falls off the spiral. The player who shows minimum loss of points wins the game.



5. Take four nails, each 10 centimetres long. Let the nails stand on their heads on a table, about 2 centimetres apart from each other. Take a horse shoe magnet and try to remove one nail at a time, without picking up the neighbouring nail or knocking it down.

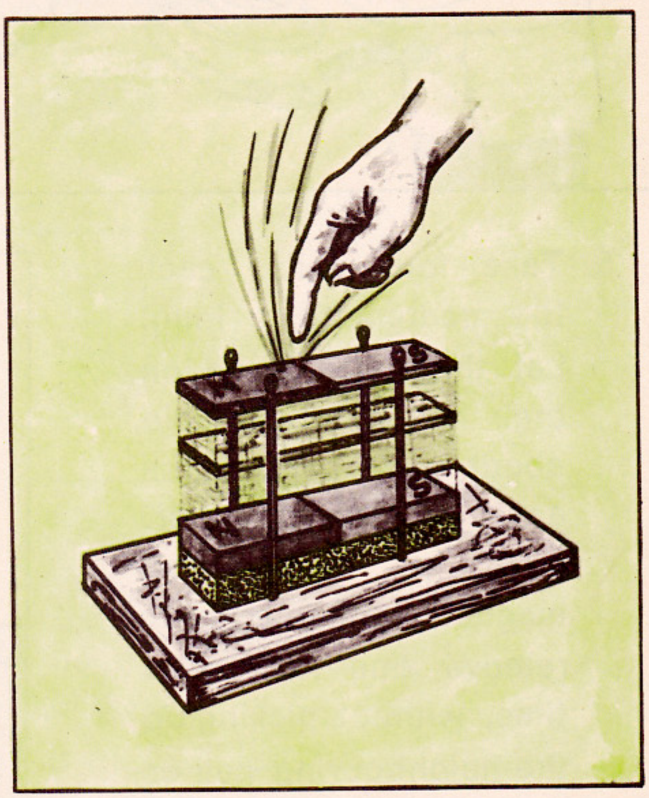


Allow your friends to take turns. One who removes most nails in a clean manner is the winner.

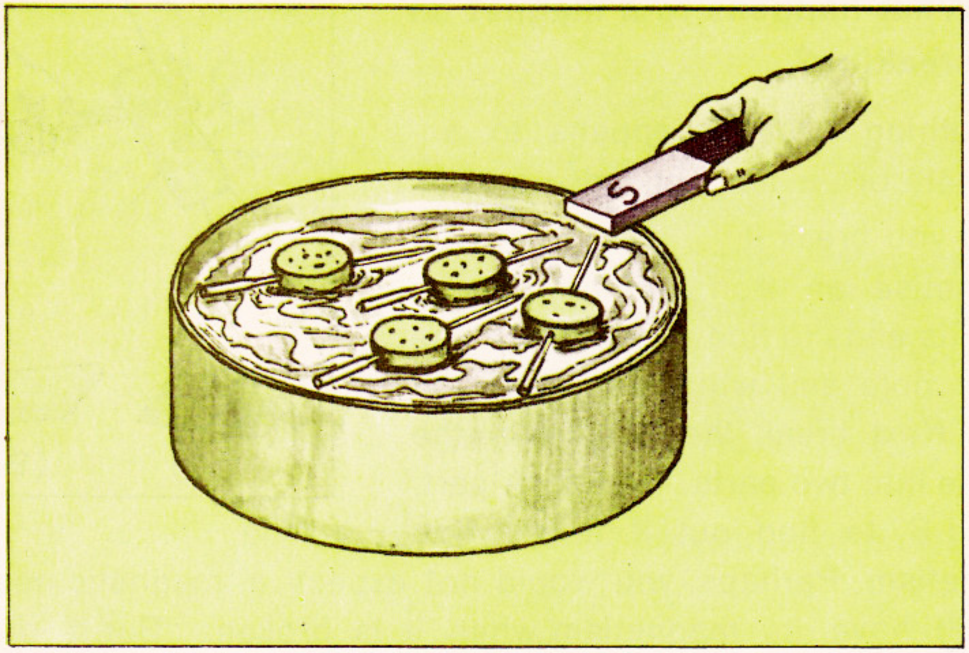
6. Try another interesting game. You can float a magnet in air!

Really? How is it possible?

Take some plasticine or clay and press it into a plain rectangular base. Place a powerful magnet on the base and press a few matches into the plasticine touching the sides of the magnet, as shown. Now place another powerful but thin magnet over the first one in such a way that its North pole is above the North pole of the first magnet. You will see that the upper magnet remains floating. If you press the upper magnet further down and then leave it, you will see that it will move up and down like a spring.



Hurrah ! Magnets are real fun !



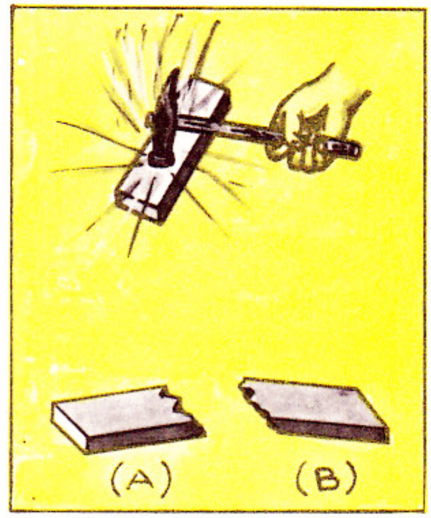
7. Magnetise a sewing needle so that its eye is the North pole. Cut four flat circular discs from a cork stopper. Push a needle through one cork disc so that it is perfectly horizontal. You may have to try two or three times before you succeed in passing it perfectly horizontal.

Take a glass or aluminium dish and fill it two-thirds with water. Place the disc gently on the surface of water. Wait for a while and watch the direction of the needle. It will point North and South.

Magnetise three more sewing needles so that their eyes are North poles. Take the three remaining discs and push a needle through each disc. Place all these in the above dish.

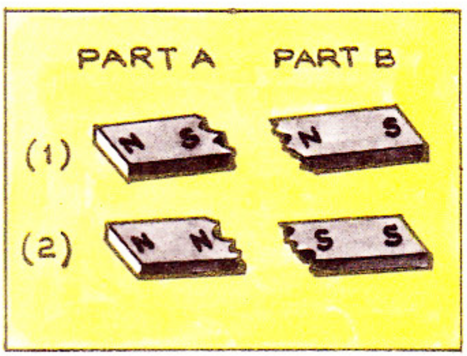
Bring the South pole of a magnet near the eyes of the needles. Watch what happens. Why do all the corks point towards the magnet?

What happens to a magnet on breaking?



Something strange happens to a magnet or a magnetised needle when you break it.

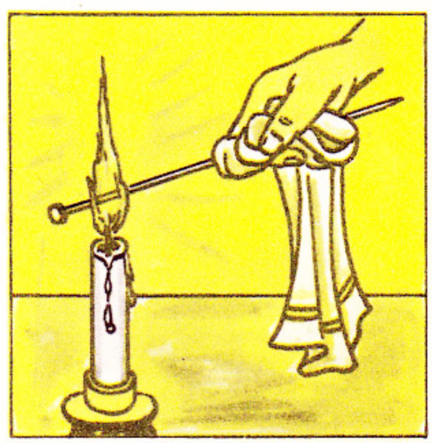
Magnetise an iron knitting needle. Test its ends to find out which is the North pole and which is the South pole. Next break the needle in the middle into two parts. Test each part, A and B, to find out if it still has magnetism. Perhaps, you would not expect a magnetic needle to still have its magnetism when it is broken. But it does. Is that not strange?



Next test both parts A and B to find which end is the North pole and which is the South pole.

Two arrangements of poles in parts A and B are shown in the diagram. Tell your teacher, after the test, which one is correct, (1) or (2)?

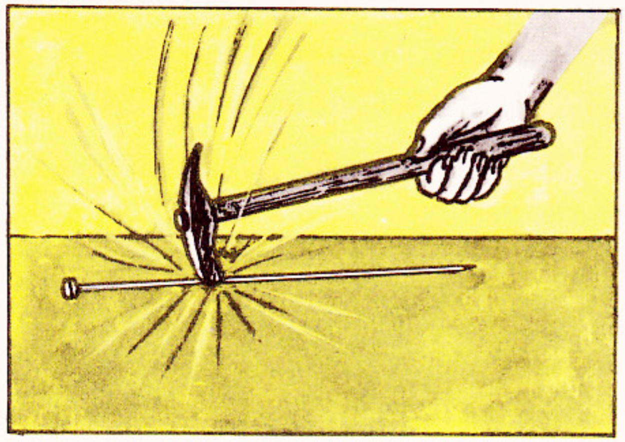
What happens to a magnet on heating?



Take another iron knitting needle. Magnetise it and test its magnetism. Does it attract iron filings?

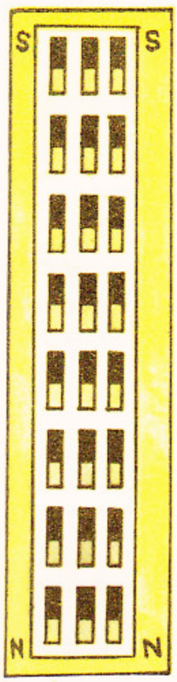
Now, hold one end of the needle with a towel and heat its other end over a candle flame for some time. Remove it from the flame and let it cool for a while. Test whether it still has its magnetism or has lost it.

Magnetise the needle again. Next, hammer it a few times and test it again. Has it lost its magnetism or still has it?



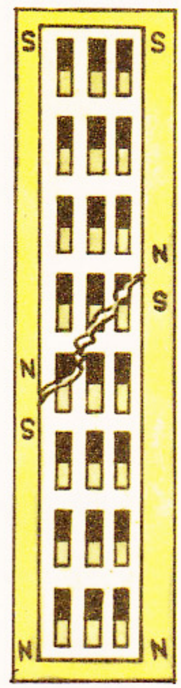
You will see that magnets lose magnetism on heating and on hammering.

What is the secret of this funny behaviour of a magnet?

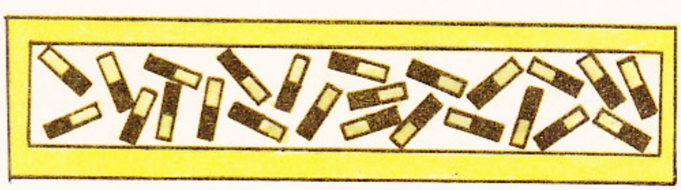


A magnet may be imagined to consist of many small magnets, as shown in the diagram. They are so small that you cannot even see them. All the small magnets lie in a line, the North pole of one facing the South Pole of the next.

If you look at the diagram carefully, you will observe that in the middle of the magnet all the South poles cancel all the North poles. The magnet, therefore, does not show any magnetism in the middle. Iron filings do not stick to it in the middle.



But all the North poles are at one end and all the South poles are at the other end. One end thus has a strong North pole, and the other end has a strong South pole. Therefore, the ends attract maximum number of iron filings.



When a magnet or a magnetic needle is broken into two parts, the small magnets

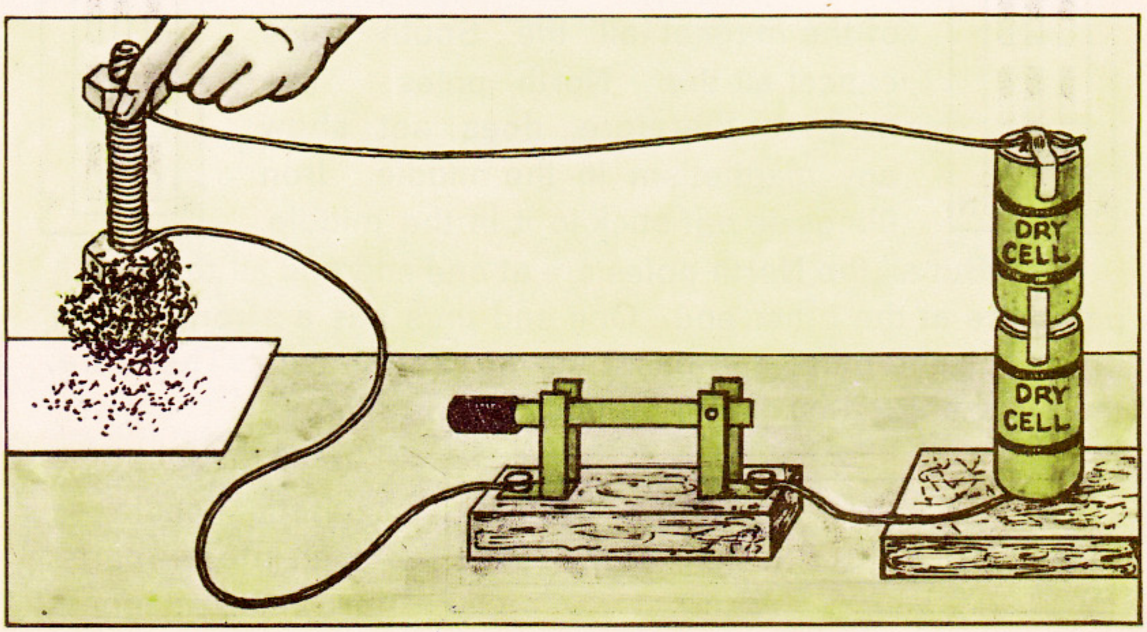
remain in the same line but get distributed in the two parts, as shown. Hence, each part of the magnet has a North end and a South end, and acts as a separate magnet.

But when the magnet is heated or hammered, the arrangement of small magnets is disturbed. They no longer lie in a line, as shown in the figure. Thus, the magnet loses its magnetism.

What is an Electromagnet?

You can make a magnet with the help of electricity also. Take an iron bolt. Wind many turns of insulated copper wire round it. Connect the two ends of the wire to a dry cell and a switch. Close the switch and make one end of the bolt touch a small heap of iron filings. Lift the bolt. You will see lots of filings clinging to it. It has become a magnet.

The current of electricity flowing from the cell through the turns of wire makes the iron bolt a magnet. It is, therefore, called an electromagnet.



Next, open the switch. Watch that most of the filings fall down. With the current of electricity switched off, the bolt has lost almost all of its magnetism. Isn't it wonderful?

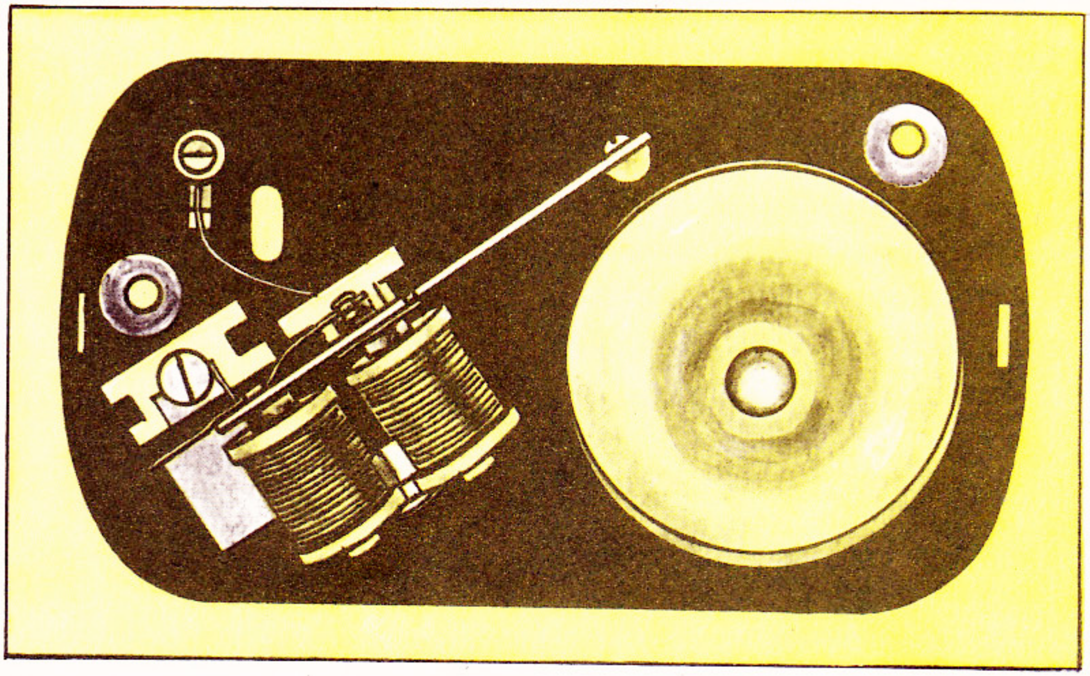
The switch should remain closed for a short time only, as long as needed. If the current is passed for a long time, the dry cell will become weak.

The girl in the picture is using an electromagnet made in a factory. It has an iron rod with many many turns of copper wire wound around it. But you cannot see the wire in the picture.

The electromagnet is connected to a dry cell through a switch. When the switch is closed, the electromagnet can lift an iron piece. When the switch is opened, the iron piece drops down.

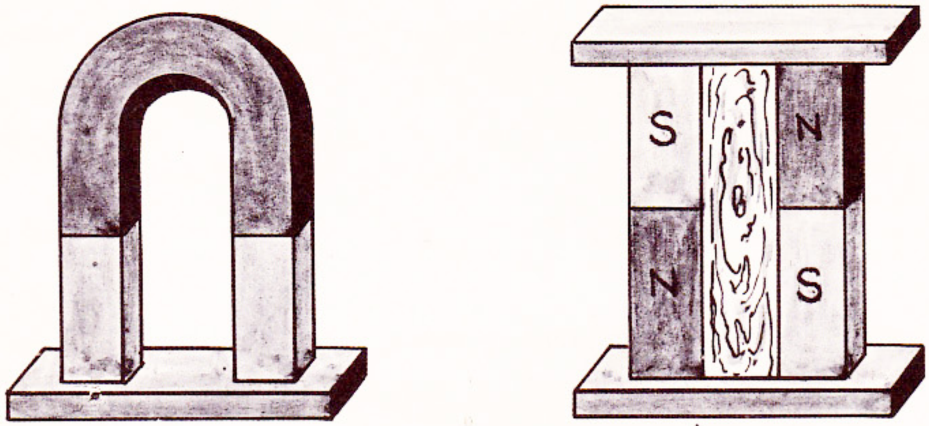
Has your door-bell an Electromagnet?

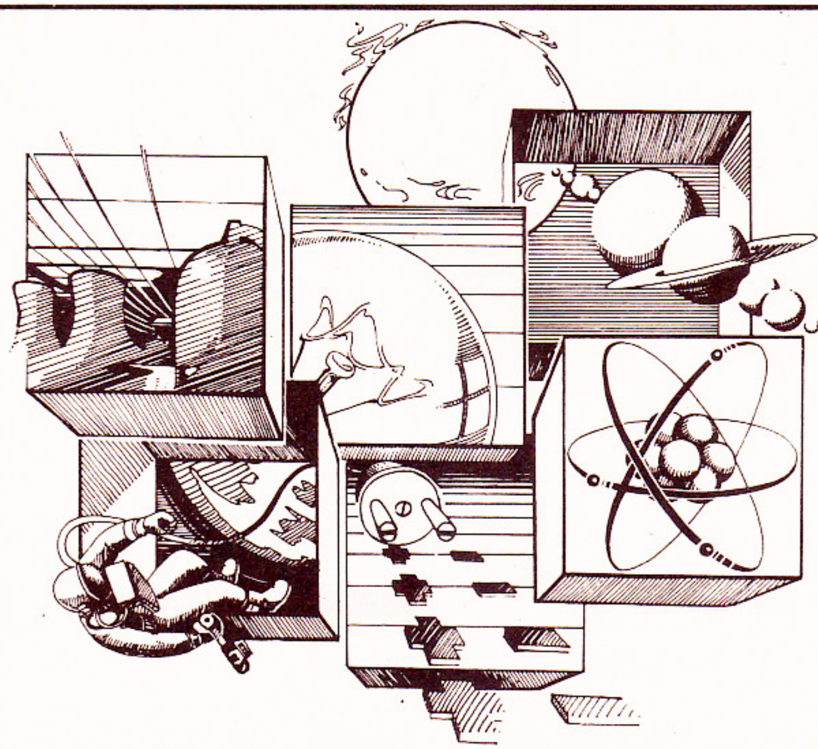
If there is a door-bell in your home, ask your father to remove its cover. Look at the electromagnet inside it. Switch the current off and on and watch how the sound is produced.



How different is an Electromagnet from an ordinary magnet?

An electromagnet attracts the same things as an ordinary magnet does. It has two poles, North and South, as an ordinary magnet has. It can attract through paper, glass and many other things as an ordinary magnet does. But it works as a magnet only as long as the current flows in its coil. When the current is cut off, it loses most of its magnetism. An ordinary magnet remains a magnet for a long time.





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About the IBH 'Junior Science Series for Children'

Science is a search for order in nature, for unity in diversity.

Science is more than a collection of facts, it is also a process in which observations and their interpretations are used to develop new concepts, to extend the understanding of the world, to suggest new areas for future. Its focus is on inquiry and action.

Children are often interested in exploring the environment around them and in finding out answers to questions that arise in their mind. To meet the curiosity of children and arouse their interest further, IBH PUBLISHING COMPANY has designed 'JUNIOR SCIENCE SERIES FOR CHILDREN' at two levels:

(1) Lower Elementary (age-group 5–9) and
(2) Upper Elementary (age group 10–13).

'Fun with Magnets' is one of the books in the Lower Elementary Series. Other books are:

1. Air around us
2. Water around us
3. Pull of the Earth
4. Sources of Heat
5. Sounds we enjoy
6. Fruits around us
7. Seeds around us

The language used in the books is simple and direct. An attempt has been made to introduce the children to concepts and processes of science within the level of their understanding. A larger number, of activities have been suggested which can be performed by children with the materials available in their home or around them.

Rs. 4.00

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